

# Environmental, Soil, and Water Science (ESWS)

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Opportunities for employment and post-graduate study are numerous for graduates of the Department of Crop, Soil, and Environmental Sciences. Environmental, Soil, and Water Science graduates find jobs with environmental consulting companies, environmental education organizations, state agencies (e.g., Extension Service, Department of Environmental Quality, Health Department), federal agencies (e.g., Environmental Protection Agency, Natural Resources Conservation Service), municipalities and local environmental services (e.g., waste management and recycling, water and wastewater treatment facilities, parks and tourism departments), a wide variety of private businesses, and environmental research.

The Environmental, Soil, and Water Science major includes courses in areas such as environmental science, water quality, soil science, soil and water conservation, and the sustainable productivity of natural resources.

## Requirements for a Major in Environmental, Soil, and Water Science (ESWS)

State minimum core (<http://catalog.uark.edu/undergraduatecatalog/gened/stateminimum/>) and discipline specific general education (<http://catalog.uark.edu/undergraduatecatalog/gened/generaleducation/>) requirements:

(Course work that meets state minimum core requirements is in bold.)

<b>University Requirements</b>	<b>1</b>
UNIV 10051 University Perspectives (Counts as General Elective)	
<b>Communication</b>	<b>12</b>
<b>Choose from English Core course (6 hours)</b>	
SPCH 10003 Public Speaking (ACTS Equivalency = SPCH 1003)	
CSES 30203 Crop, Soil, and Environmental Sciences Colloquium or ACOM 31 Communicating Agriculture to the Public	
<b>U.S. History and Government</b>	<b>3</b>
<b>Choose 3 hours U.S. History/Government from state minimum core</b>	
<b>Mathematics</b>	<b>6</b>
<b>MATH 11003 College Algebra (ACTS Equivalency = MATH 1103)</b>	
MATH 12003 Plane Trigonometry (ACTS Equivalency = MATH 1203) (Higher level MATH is encouraged for students with an ACT of 26 or higher and considering graduate school.)	
<b>Sciences</b>	<b>35</b>

**BIOL 10103 Principles of Biology (ACTS Equivalency = & BIOL 10101 BIOL 1014 Lecture) and Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)**

BIOL 20003 General Microbiology (ACTS Equivalency = BIOL & BIOL 20001 2004 Lecture)  
and General Microbiology Laboratory (ACTS Equivalency = BIOL 2004 Lab)

BIOL 38773 General Ecology  
& BIOL 38771 and General Ecology Laboratory  
or ENSC 32203 Ecosystems Assessment  
& ENSC 32201 and Ecosystems Assessment Laboratory

**CSES 12003 Introduction to Plant Sciences**

**CHEM 14103 University Chemistry I (ACTS Equivalency = & CHEM 14101 CHEM 1414 Lecture) and University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)**

**CHEM 14203 University Chemistry II (ACTS Equivalency = & CHEM 14201 CHEM 1424 Lecture) and University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)**

CHEM 26103 Organic Physiological Chemistry (ACTS & CHEM 26101 Equivalency = CHEM 1224 Lecture)  
and Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab)

or CHEM 36053 Organic Chemistry I  
& CHEM 36051 and Organic Chemistry I Laboratory

**GEOL 11103 Physical Geology (ACTS Equivalency = GEOL & GEOL 11101 1114 Lecture) and Physical Geology Laboratory (ACTS Equivalency = GEOL 1114 Lab)**

**PHYS 20103 College Physics I (ACTS Equivalency = PHYS & PHYS 20101 2014 Lecture) and College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab)**

**Fine Arts and Humanities 6**

**Select 3 hours Fine Arts from state minimum core**

**Select 3 hours Humanities from state minimum core**

**Social Sciences 9**

**Select 9 hours Social Sciences from state minimum core**

**ESWS Requirements\***

**Environmental Science Core 17**

CSES 22003 Soil Science

CSES 22001 Soil Science Laboratory

ENSC 10003 Environmental Science

ENSC 10001 Environmental Science Laboratory

ASTM 29003 Agricultural and Human Environmental Sciences Applications of Microcomputers

ENSC 30003 Introduction to Water Science

MATH 21003 Principles of Statistics (ACTS Equivalency = MATH 2103)

**Soil Science Core**

Select one of the following: 3-4

CSES 32104 Soil Resources and Nutrient Cycles

CSES 42204 Soil Fertility

CSES 42503 Soil Classification and Genesis

CSES 45503	Wetland Soils	
ENSC 32603	Soil and Water Conservation	
ENSC 42603	Environmental Soil Science	
<b>Water Science Core</b>		
Select one of the following:		3
ENSC 40203	Water Quality	
GEOS 33303	Oceanography	
GEOS 40303	Hydrogeology	
GEOS 43603	Climatology	
GEOS 44703	Applied Climatology	
<b>Natural Resources Core</b>		
Select 9 hours from the following two groups:		9
<b>Environmental Science**</b>		
ASTM 31503	Surveying in Agriculture and Forestry	
CSES 20103	Pest Management	
CSES 35501	Soil Profile Description (1 hour, may take twice)	
CSES 4620V	Internship (1-6 credit hours)	
CSES 45503	Wetland Soils	
ENSC 31003	Plants and Environmental Restoration	
ENSC 32603	Soil and Water Conservation	
ENSC 36003	GIS for Environmental Science	
ENSC 44001	Professional Certification Preparation	
GEOS 30403	Sustaining Earth	
GEOS 35403	Geospatial Applications and Information Science	
<b>Environmental Studies (0-3 hours)</b>		
AGEC 34103	Principles of Environmental Economics	
AGEC 35003	Agricultural Law I	
AGEC 35203	Environmental and Natural Resources Law	
ENSC 39303	Environmental Ethics	
SOCI 46003	Environmental Sociology	
General Electives		16-17
<b>Total Hours</b>		<b>120</b>

\*Courses within major cannot be taken for duplicate credit.  
 \*\*One 3-hr study abroad course, either Experiential Learning in Indian Agriculture (Jan) or Sustainability in the Eurozone Agro-Food Chain (May), which are both taken under AFLS 4010V/AFLS 401HV, can be substituted for 3 hours of Natural Resources core.

## Environmental, Soil, and Water Science B.S.A.

### Eight-Semester Degree Program

Students wishing to follow the degree plan should see the Eight-Semester Degree Policy (<http://catalog.uark.edu/undergraduatecatalog/academicregulations/eightsemesterdegreecompletionpolicy/>) for university requirements of the program.

	Units	
	Fall	Spring
ENGL 10103 Composition I (ACTS Equivalency = ENGL 1013) (Satisfies General Education Outcome 1.1)	3	
ENSC 10003 Environmental Science & ENSC 10001 Environmental Science Laboratory Satisfies General Education Outcomes 3.4 and 5.1:	4	

BIOL 10103 Principles of Biology (ACTS Equivalency = BIOL 1014 Lecture) & BIOL 10101 Principles of Biology Laboratory (ACTS Equivalency = BIOL 1014 Lab)	4	
Satisfies General Education Outcome 3.4:		
MATH 11003 College Algebra (ACTS Equivalency = MATH 1103) (Satisfies General Education Outcome 2.1)	3	
UNIV 10051 University Perspectives	1	
Fine Arts or Humanities State Minimum Core Elective (Satisfies General Education Outcome 3.1 or 3.2) <sup>1, 2</sup>		3
ENGL 10203 Composition II (ACTS Equivalency = ENGL 1023) (Satisfies General Education Outcome 1.1)		3
CSES 12003 Introduction to Plant Sciences		3
Social Sciences State Minimum Core Elective (Satisfies General Education Outcome 3.3)		3
CHEM 14103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) & CHEM 14101 University Chemistry I Laboratory (ACTS Equivalency = CHEM 1414 Lab)		4
<b>Year Total:</b>	<b>15</b>	<b>16</b>

	Units	
	Fall	Spring
General Elective as Broadening Elective (could apply toward a minor)	3	
GEOL 11103 Physical Geology (ACTS Equivalency = GEOL 1114 Lecture) & GEOL 11101 Physical Geology Laboratory (ACTS Equivalency = GEOL 1114 Lab)	4	
U.S. History or Government State Minimum Core Elective (Satisfies General Education Outcome 4.2)	3	
SPCH 10003 Public Speaking (ACTS Equivalency = SPCH 1003) (Satisfies General Education Outcomes 1.2 and 5.1)	3	
MATH 12003 Plane Trigonometry (ACTS Equivalency = MATH 1203)	3	
CHEM 14203 University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture) & CHEM 14201 University Chemistry II Laboratory (ACTS Equivalency = CHEM 1424 Lab)		4
Fine Arts or Humanities State Minimum Core Elective (Satisfies General Education Outcome 3.1 or 3.2) <sup>1, 2</sup>		3
Social Sciences State Minimum Core Elective (Satisfies General Education Outcome 3.3)		3
ENSC 30003 Introduction to Water Science		3
ASTM 29003 Agricultural and Human Environmental Sciences Applications of Microcomputers		3
<b>Year Total:</b>	<b>16</b>	<b>16</b>

Third Year	Units	
	Fall	Spring
CSES 22003 Soil Science & CSES 22001 Soil Science Laboratory	4	
PHYS 20103 College Physics I (ACTS Equivalency = PHYS 2014 Lecture) & PHYS 20101 College Physics I Laboratory (ACTS Equivalency = PHYS 2014 Lab)	4	
Water Science or Natural Resources Core	3	
Select one of the following: General Electives as AFLS Broadening Electives (Could apply toward a minor) <sup>4</sup>	3-4	
CHEM 36053 Organic Chemistry I & CHEM 36051 Organic Chemistry I Laboratory	4	
BIOL 20003 General Microbiology (ACTS Equivalency = BIOL 2004 Lecture) & BIOL 20001 General Microbiology Laboratory (ACTS Equivalency = BIOL 2004 Lab)		4
CHEM 26103 Organic Physiological Chemistry (ACTS Equivalency = CHEM 1224 Lecture) & CHEM 26101 Organic Physiological Chemistry Laboratory (ACTS Equivalency = CHEM 1224 Lab)		4
Social Sciences State Minimum Core Elective (Satisfies General Education Outcomes 3.3 and 4.1) <sup>3</sup>		3
Water Science or Soil Science Core (For Water Science: Recommended: ENSC 30003; Soil Science: Pre-at least CSES 22003)		3-4
Year Total:	18	14

Fourth Year	Units	
	Fall	Spring
Select one of the following: CSES 30203 Crop, Soil, and Environmental Sciences Colloquium (Satisfies General Education Outcome 6.1) ACOM 31403 Communicating Agriculture to the Public	3	
Select one of the following: ENSC 32203 Ecosystems Assessment & ENSC 32201 Ecosystems Assessment Laboratory BIOL 38773 General Ecology & BIOL 38771 General Ecology Laboratory	4	
Statistics or Natural Resources Core	3	
Soil Science or Natural Resources Core	3-4	
Natural Resources Core or General Elective (Could apply elective toward a minor) <sup>4</sup>	3	
Natural Resources Core or General Elective <sup>4</sup>		3
Statistics or Natural Resources Core		3
General Elective <sup>4</sup>		3
General Elective as Broadening Elective (Could apply toward a minor) <sup>4</sup>		2-3
General Elective (May wish to take another elective. Could apply toward a minor) <sup>4</sup>		2-3
Year Total:	16	13

**Total Units in Sequence: 124**

- The Fine Arts Elective courses which satisfy General Education Outcome 3.1 include:  
ARCH 10003, ARHS 10003, COMM 10003, DANC 10003, LARC 10003, MUSC 10003, MUSC 100H3, MUSC 10103, MUSC 101H3, MUSC 13303, THTR 10003, THTR 10103, or THTR 101H3.
- The Humanities Elective courses which satisfy General Education Outcome 3.2 include:  
AAST 20203, ANTH 10303, ARCH 10103, CLST 10003, CLST 100H3, CLST 10103 or intermediate-level world language.
- The Social Science Elective courses which satisfy General Education Outcomes 3.3 and 4.1 include:  
ANTH 10203, COMM 10203, HDFS 14003, HDFS 24103, HIST 11193, HIST 111H3, HIST 11293, HIST 112H3, HIST 20903, HUMN 111H4, HUMN 211H4, INST 28103, INST 281H3, PLSC 20103, PLSC 28103, PLSC 281H3, RESM 28503, SOCI 10103, SOCI 101H3, or SOCI 20103.
- Students must complete 40 hours of upper division courses (3000-4000 level). It is recommended that students consult with their academic adviser when making course selections.

### Minor in Natural Resources Management (NRMT-M)

A student planning to minor in Natural Resources Management must notify the program adviser for consultation and more detailed information. No more than 9 hours can be counted towards a Natural Resources Management minor with an ESWS major. The Natural Resources Management Minor consists of 18 hours to include the following:

Required courses	7
ENSC 10003 Environmental Science	
ENSC 10001 Environmental Science Laboratory	
CSES 22003 Soil Science or ENSC 30(Introduction to Water Science)	
Optional courses (11 hours, at least 8 hours must be 3000-level or above)	11
ACOM 31403 Communicating Agriculture to the Public	
AGEC 35003 Agricultural Law I	
AGEC 35203 Environmental and Natural Resources Law	
BIOL 38773 General Ecology & BIOL 38771 and General Ecology Laboratory	
CSES 12003 Introduction to Plant Sciences	
CSES 20103 Pest Management	
CSES 22001 Soil Science Laboratory	
CSES 32104 Soil Resources and Nutrient Cycles	
CSES 35501 Soil Profile Description	
CSES 40133 Advanced Crop Science	
CSES 41303 Ecology and Morphology of Weedy and Invasive Plants	
CSES 42204 Soil Fertility	
CSES 42503 Soil Classification and Genesis	
CSES 45503 Wetland Soils	
CSES 4620V Internship	

ENSC 31003	Plants and Environmental Restoration	
ENSC 32203	Ecosystems Assessment	
& ENSC 32201	and Ecosystems Assessment Laboratory	
ENSC 32603	Soil and Water Conservation	
ENSC 36003	GIS for Environmental Science	
ENSC 40203	Water Quality	
ENSC 42603	Environmental Soil Science	
ENSC 44001	Professional Certification Preparation	
GEOS 30403	Sustaining Earth	
GEOS 35403	Geospatial Applications and Information Science	
<b>Total Hours</b>		<b>18</b>

## Minor in Soil Science (SOIL-M)

A student planning to minor in Soil Science must notify the program adviser for consultation and more detailed information.

The Soil Science minor will consist of a total of 18 hours comprising the following required and elective courses. No more than 9 hours can be counted towards a Soil Science minor with an Environmental Soil and Water Science major. Those students interested in obtaining certification in the area of soil science will need at least 15 soil science hours, preferably covering each of the sub-disciplines (i.e., fertility, genesis, morphology, and classification, chemistry, physics, soil biology and ecology, and land use and management).

### Required Courses

CSES 22003	Soil Science	4
& CSES 22001	and Soil Science Laboratory	

### Elective Courses

Select the remaining 14 hours from the following courses:

Undergraduate Courses		
CSES 32104	Soil Resources and Nutrient Cycles	
CSES 35501	Soil Profile Description (may be taken for up to 2 hours credit)	
CSES 42204	Soil Fertility	
CSES 42503	Soil Classification and Genesis	
CSES 45503	Wetland Soils	
ENSC 32603	Soil and Water Conservation	
ENSC 42603	Environmental Soil Science	
ENSC 44001	Professional Certification Preparation (Soils Exam)	
Graduate Courses		
CSES 50303	Advanced Soil Fertility and Plant Nutrition	
CSES 52204	Soil Physics	
CSES 52604	Microbial Ecology	
CSES 54503	Soil Chemistry	
<b>Total Hours</b>		<b>18</b>

## Crop, Soil and Environmental Sciences Courses

### CSES 10101. Introduction to Crop, Soil, and Environmental Science. 1 Hour.

An introduction to the CSES department and majors in Environmental Soil and Water Sciences and Crop Management. Emphasis will be placed on issues and opportunities within these disciplines and orienting students to the department and University of Arkansas. Required of all department majors with less than 24 semester credit hours. Offered second eight weeks of the semester. Prerequisite: Freshman and sophomore standing only. (Typically offered: Fall)

### CSES 12003. Introduction to Plant Sciences. 3 Hours.

An introduction to basics of agricultural crop plant structure, growth, and production. (Typically offered: Fall and Spring)

### CSES 20103. Pest Management. 3 Hours.

Introduction to basic principles of pest management as they relate to vertebrate animals, insects, plant disease and weeds. Selected pests are studied with emphasis on current management approaches and alternative pest control. (Typically offered: Spring)

### CSES 21001. Crop Science Laboratory. 1 Hour.

A series of laboratory experiments designed to reinforce principles of plant growth and development, reproduction, classification, and the utilization of plant products. Emphasis is placed on major crop plant species. Experiments are conducted by individuals or by teams. Laboratory consists of a single, 2-hour period each week. Required for Crop Management majors. Corequisite: CSES 21033. (Typically offered: Spring)

### CSES 21033. Crop Science. 3 Hours.

Principles of crop growth, development, and utilization and how these principles relate to production. Emphasis on major agronomic crop species. Lecture 3 hours per week. (Typically offered: Spring)

### CSES 22001. Soil Science Laboratory. 1 Hour.

Field and laboratory exercises related to the study of the physical, chemical, and biological properties of soils. Laboratory mandatory for all crop management and environmental, soil, and water science majors and optional for others. Laboratory 2 hours per week. Pre- or Corequisite: CSES 22003. (Typically offered: Fall and Spring)

### CSES 22003. Soil Science. 3 Hours.

Origin, classification, and physical, chemical, and biological properties of soils. Lecture 3 hours, discussion 1 hour per week. Corequisite: Drill component. Prerequisite: MATH 11003 or higher (to include MATH 12003, MATH 13004, MATH 15104, MATH 22103, MATH 22003, MATH 20503, MATH 24005, MATH 25104, MATH 24004, MATH 25004, or MATH 26004) and CHEM 14103 or CHEM 12103. (Typically offered: Fall and Spring)

### CSES 23002. Professional Development in Crop, Soil, and Environmental Sciences. 2 Hours.

This course is designed to prepare students majoring in Crop Science or Environmental, Soil, and Water Sciences to enter a career in a related field or begin graduate school after completing their undergraduate degree. Topics covered include creating a job application, professional behavior, interview skills, writing a scientific literature review, and delivering a professional presentation related to crop, soil, or environmental science. (Typically offered: Fall)

### CSES 30203. Crop, Soil, and Environmental Sciences Colloquium. 3 Hours.

A communication-intensive course covering topics in agronomy and environmental, soil, and water science with particular emphasis on spoken communication but also including written communication, group activities, professionalism, ethics, problem solving, and information retrieval. A student-oriented class with collaborative participation. Colloquium workshop: 3 hours per week. Prerequisite: SPCH 10003 and Junior or Senior standing only. (Typically offered: Fall)

### CSES 32104. Soil Resources and Nutrient Cycles. 4 Hours.

Integration of the fundamental concepts of the biological, chemical, and physical properties of soil systems and their roles in managing soil resources. Lecture 3 hours, laboratory 3 hours per week. Pre- or Corequisite: BIOL 20003 and BIOL 20001. Corequisite: Lab component. Prerequisite: CSES 22003. (Typically offered: Spring Odd Years)

### CSES 33102. Cotton Production. 2 Hours.

Principles and techniques associated with production of cotton. Recitation 2 hours per week. Prerequisite: CSES 12003 or CSES 21033. (Typically offered: Fall Even Years)

**CSES 33202. Soybean Production. 2 Hours.**

An overview of the history and utilization of soybean as well as the physiological and environmental basis for the development of economical soybean production practices. Recitation 2 hours per week. Prerequisite: CSES 12003 or CSES 21033. (Typically offered: Spring Odd Years)

**CSES 33302. Rice Production. 2 Hours.**

A study of the principles and practices involved in rice culture worldwide with major emphasis on the United States. Recitation 2 hours per week. Prerequisite: CSES 12003 or CSES 21033. (Typically offered: Fall Odd Years)

**CSES 33402. Cereal Grain Production. 2 Hours.**

An overview of the botany, production, cultural practices, soil & climatic adaptation and utilization of the major cereal grain crops. Prerequisite: CSES 12003 or CSES 21033. (Typically offered: Spring Even Years)

**CSES 35501. Soil Profile Description. 1 Hour.**

Training for soil profile description writing and membership of judging teams. (Typically offered: Fall) May be repeated for up to 8 hours of degree credit.

**CSES 37003. Precision Agriculture for Crops. 3 Hours.**

This course will provide students with a practical understanding of precision agriculture and crop/ecosystem monitoring with remote and proximal sensing technology. Prerequisite: MATH 11003 and CSES 12003. (Typically offered: Spring)

**CSES 4000V. Special Problems. 1-6 Hour.**

Work on special problems in crop, soil and environmental sciences or related field. (Typically offered: Fall, Spring and Summer) May be repeated for up to 6 hours of degree credit.

**CSES 40133. Advanced Crop Science. 3 Hours.**

Fundamental concepts of crop physiology, crop improvement, seed science, and crop production systems. Recitation 3 hours per week. Prerequisite: CSES 21033 and CSES 22003. (Typically offered: Spring)

**CSES 4020V. Special Topics. 1-3 Hour.**

Studies of selected topics in crop, soil and environmental sciences not available in other courses. (Typically offered: Irregular) May be repeated for up to 12 hours of degree credit.

**CSES 41003. Plant Breeding. 3 Hours.**

This course aims to provide students with an extensive background in plant breeding applied to cultivar development, including but not limited to understanding the foundations of plant breeding, modes of reproduction in plants, various breeding methods, and introduction to quantitative genetics. Prerequisite: ANSC 31203 or BIOL 23373. (Typically offered: Fall)

**CSES 41303. Ecology and Morphology of Weedy and Invasive Plants. 3 Hours.**

Study of weeds as economic pests occurring in both agricultural and nonagricultural situations and including poisonous plants and other specific weed problems. Gross morphological plant family characteristics which aid identification, habitat of growth and distribution, ecology, competition, and allelopathy are discussed. Lecture 2 hours, laboratory 2 hours a week. Corequisite: Lab component. Prerequisite: CSES 21033 or HORT 20003. (Typically offered: Fall)

**CSES 41403. Principles of Weed Control. 3 Hours.**

Advanced concepts and technology used in modern weed control practices and study of the chemistry and specific activity of herbicides in current usage. Lecture 2 hours, laboratory 2 hours per week. Corequisite: Lab component. Prerequisite: CHEM 12103 and CHEM 12101. (Typically offered: Spring)

**CSES 42204. Soil Fertility. 4 Hours.**

Study of the soil's chemical, biological and physical properties, and human modification of these properties, as they influence the uptake and utilization of the essential nutrients by plants. Lecture 3 hours, laboratory 2 hours per week. Pre- or Corequisite: CHEM 14203 and CHEM 14201 or (CHEM 12103 and CHEM 12101 and CHEM 26103 and CHEM 26101). Corequisite: Lab component. Prerequisite: CSES 22001 and CSES 22003. (Typically offered: Fall)

**CSES 42503. Soil Classification and Genesis. 3 Hours.**

Lecture and field evaluation of soil properties and their relation to soil genesis and soil classification with emphasis on soils of Arkansas. Lecture 2 hours, laboratory 2 hours per week. Corequisite: Lab component. Prerequisite: CSES 22003 and CSES 22001. (Typically offered: Fall Odd Years)

**CSES 45503. Wetland Soils. 3 Hours.**

This course explains the chemical, physical, and morphological characteristics of wetland soils and describes the techniques for identifying wetland soils using field indicators and monitoring equipment. This course also explains principles of wetland creation, restoration, and mitigation - all key components in assuring the sustainability of valuable wetland resources. Prerequisite: (CSES 22003 and CSES 22001) or CSES 35501. (Typically offered: Spring Odd Years)

**CSES 4620V. Internship. 1-6 Hour.**

Supervised practical work experience in agronomy and environmental science to develop and demonstrate professional competence. Faculty approval of project proposal prior to enrollment and written and oral reports after the project is complete are required. Prerequisite: Instructor consent. (Typically offered: Fall, Spring and Summer) May be repeated for up to 6 hours of degree credit.

## Environmental Science Courses

**ENSC 10001. Environmental Science Laboratory. 1 Hour.**

Laboratory, field trip, and discussion sessions covering the concepts and information allowing students to critically evaluate environmental issues. Topics will include: laboratory safety, recycling, composting, geographic information systems, soil testing, water quality, hazardous wastes, waste disposal, wetlands, wastewater treatment, and sustainable food systems. Laboratory 2 hours/week. Corequisite: ENSC 10003. (Typically offered: Fall and Spring)

**ENSC 10003. Environmental Science. 3 Hours.**

Series of lectures and discussions introducing the topic of environmental science including factors related to water, soil, and air quality. (Typically offered: Fall and Spring)

**ENSC 100H1. Honors Environmental Science Laboratory. 1 Hour.**

Laboratory, field trip, and discussion sessions covering the concepts and information allowing students to critically evaluate environmental issues. Topics will include: laboratory safety, recycling, composting, geographic information systems, soil testing, water quality, hazardous wastes, waste disposal, wetlands, wastewater treatment, and sustainable food systems. Laboratory 2 hours/week. Corequisite: ENSC 10003. (Typically offered: Fall and Spring)

**ENSC 100H3. Honors Environmental Science. 3 Hours.**

Series of lectures and discussions introducing the topic of environmental science including factors related to water, soil, and air quality. If taking course for University core Natural Science credit, ENSC 10001 is a co-requisite. Corequisite: Drill Component. Prerequisite: Honors standing. (Typically offered: Fall and Spring)

**ENSC 30003. Introduction to Water Science. 3 Hours.**

Properties, occurrence, and description of the types, functions, quality and quantity, potential contaminants, uses, and guiding policies and regulations of the various water resources in the environment. Prerequisite: (ENSC 10003 OR CHEM 10003 (or higher) OR GEOL 11103 (or higher) OR BIOL 10103). (Typically offered: Spring)

**ENSC 31003. Plants and Environmental Restoration. 3 Hours.**

Selection, establishment, and use of plants to promote soil stabilization, water quality, and wildlife habitat. Principles and practices of managing plants for soil remediation, nutrient and sediment trapping, and restoration of plant communities. Prerequisite: CSES 12003 or HORT 20003 or BIOL 10303. (Typically offered: Fall Even Years)

**ENSC 310H3. Honors Plants and Environmental Restoration. 3 Hours.**

Selection, establishment, and use of plants to promote soil stabilization, water quality, and wildlife habitat. Principles and practices of managing plants for soil remediation, nutrient and sediment trapping, and restoration of plant communities. Prerequisite: CSES 12003 or HORT 20003 or BIOL 10303 and honors standing. (Typically offered: Fall)

**ENSC 32201. Ecosystems Assessment Laboratory. 1 Hour.**

The purpose of this laboratory is to complement concepts learned in lecture by carrying out experiments that familiarize students with methods used in soil and aquatic ecology. Students will collect samples, analyze and interpret data obtained from soil and water samples. Lab will meet once per week for 3 hours. Corequisite: ENSC 32203. (Typically offered: Fall Even Years)

**ENSC 32203. Ecosystems Assessment. 3 Hours.**

Application of basic ecological principles to gain an appreciation for ecosystem assessment and management. Lecture 3 hours per week. Prerequisite: BIOL 10103. (Typically offered: Fall Even Years)

**ENSC 32603. Soil and Water Conservation. 3 Hours.**

Effect of land use on water quality. Major sources of agricultural nonpoint pollutants. Best management practices used to minimize water quality impacts. Prerequisite: CSES 22003. (Typically offered: Fall)

**ENSC 34103. Principles of Environmental Economics. 3 Hours.**

An introductory, issues-oriented course in the economics of the environment. What is involved in society making decisions about environmental quality will be studied. Environmental issues important to the State of Arkansas and the United States will be emphasized. Prerequisite: AGECE 11003 or ECON 22003. (Typically offered: Spring)

**ENSC 36003. GIS for Environmental Science. 3 Hours.**

Provide instruction on the uses of GIS techniques in solving practical environmental and agricultural land use problems. Areas include: 1) an introduction to spatial variability in soils with an emphasis on the application of GIS techniques to map and understand spatial parameters important to different land uses, and 2) development of individual experience in the use of GIS in solving environmental and agricultural problems using an oral and written term project. Prerequisite: CSES 22003. (Typically offered: Spring Odd Years)

**ENSC 39303. Environmental Ethics. 3 Hours.**

The course addresses ethical questions about nature and the natural environment. Topics of discussion include anthropocentric and biocentric ethics, population control, obligations to future generations, animal rights, moral considerability, Leopold's land ethic, deep ecology, and ecofeminism. Lecture/discussions 3 hours per week. Prerequisite: ENSC 10003 or PHIL 20003 or PHIL 21003. (Typically offered: Spring)

**ENSC 4000V. Special Problems. 1-3 Hour.**

Work on special problems in environmental science or related fields. (Typically offered: Irregular) May be repeated for up to 8 hours of degree credit.

**ENSC 400HV. Honors Special Problems. 1-3 Hour.**

Work on special problems in environmental science or related fields. Prerequisite: Honors Standing. (Typically offered: Irregular) May be repeated for up to 8 hours of degree credit.

This course is equivalent to ENSC 4000V.

**ENSC 40203. Water Quality. 3 Hours.**

Physical, chemical, and biological characteristics of natural waters (rain, river, lake, soil, ground, etc.). Discussion of water quality parameters such as pH, alkalinity and acidity, redox, hardness, BOD, TSS, etc. Aquatic processes of pollutants and principles of modeling. Prerequisite: CHEM 14203 and CHEM 14201 and BIOL 10103 and BIOL 10101. (Typically offered: Fall)

**ENSC 40303. Analysis of Environmental Contaminants. 3 Hours.**

Methods of analysis for inorganic and organic contaminants, and microorganisms in soil and water. Quality assurance and quality control, sampling protocols, sample handling, instrumentation and data analysis. Lecture 3 hours per week. Pre- or Corequisite: CHEM 26103 and CHEM 26101 or CHEM 36053 and CHEM 36051. (Typically offered: Spring Even Years)

**ENSC 42603. Environmental Soil Science. 3 Hours.**

Study of the behavior of pesticides, toxic organic compounds, metals, nutrients, and pathogenic microorganisms in the soil/plant/water continuum. Lecture 3 hours per week. Pre- or Corequisite: PHYS 20103 and PHYS 20101. (Typically offered: Spring Even Years)

**ENSC 44001. Professional Certification Preparation. 1 Hour.**

This class is meant to reinforce concepts and skills already learned in other soil and environmental science and related courses and to provide the opportunity to prepare to take a national certification examination. If so chosen, students may pursue certification as soil or environmental science professionals. Prerequisite: Senior standing. (Typically offered: Spring)